

# Biophysical Interactions in the Alley Cropping System in Saskatchewan

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# Introduction

- Shelterbelt is the most common agroforestry practice in the Canadian Prairies, SK
- Ecological functions of shelterbelts are well known
  - Controlling windy erosion, snow trapping and distribution, soil moisture regulations, biodiversity conservation in eco-buffers
  - On-going work on GHGs mitigation potential of shelterbelts
- Unlike Eastern Canada & US, little information is available on tree-crop interactions under alley cropping systems in the Canadian Prairies

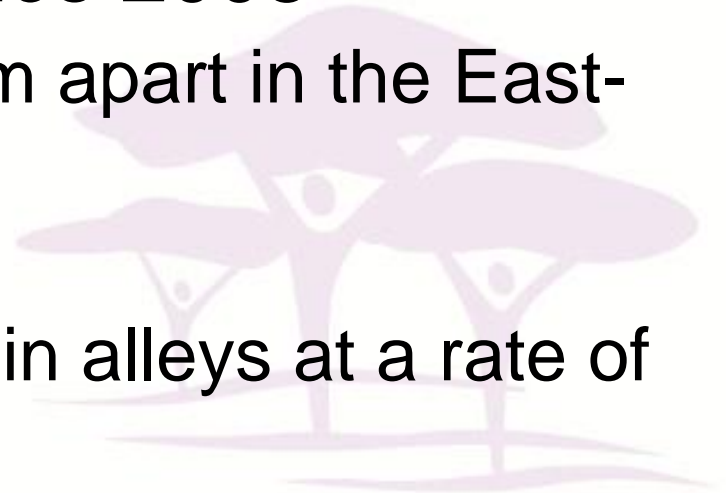
# Objectives

- To evaluate the effects of distance from tree row, row orientation, and sampling depth on soil moisture, light and yield and nutrition of oats (*Avena sativa* L.) in the alleyways

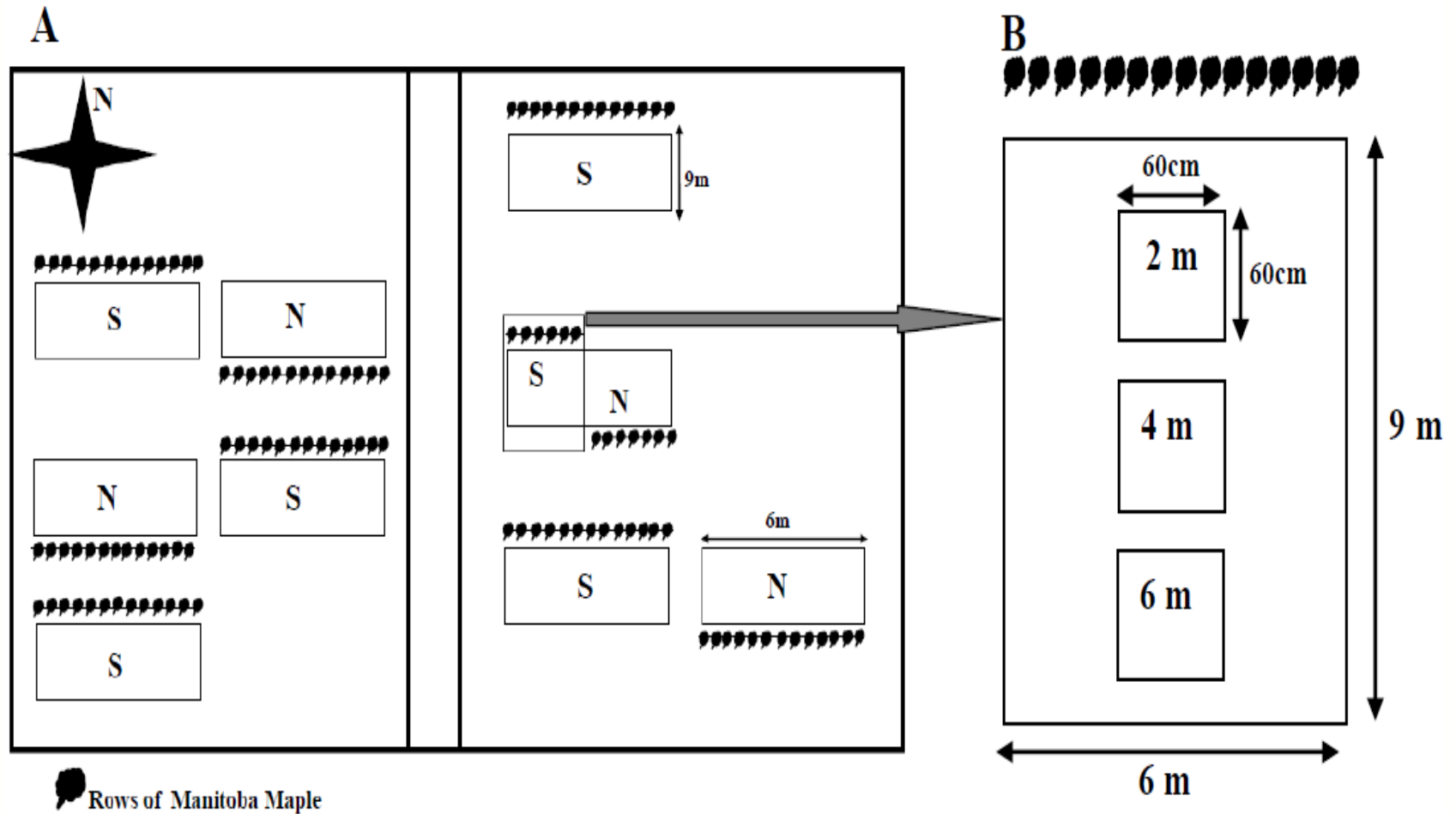


# Study Site and Establishment

- The Shelterbelt Centre, Indian Head, SK
- The experiment adopted a 9-year old Manitoba maple alley cropping site managed as a weed control trial since 2008
  - Trees were planted at 11-m apart in the East-West orientation in 2004
  - Trees height was 3 m
  - In 2012, oats were seeded in alleys at a rate of 90kg ha<sup>-1</sup>



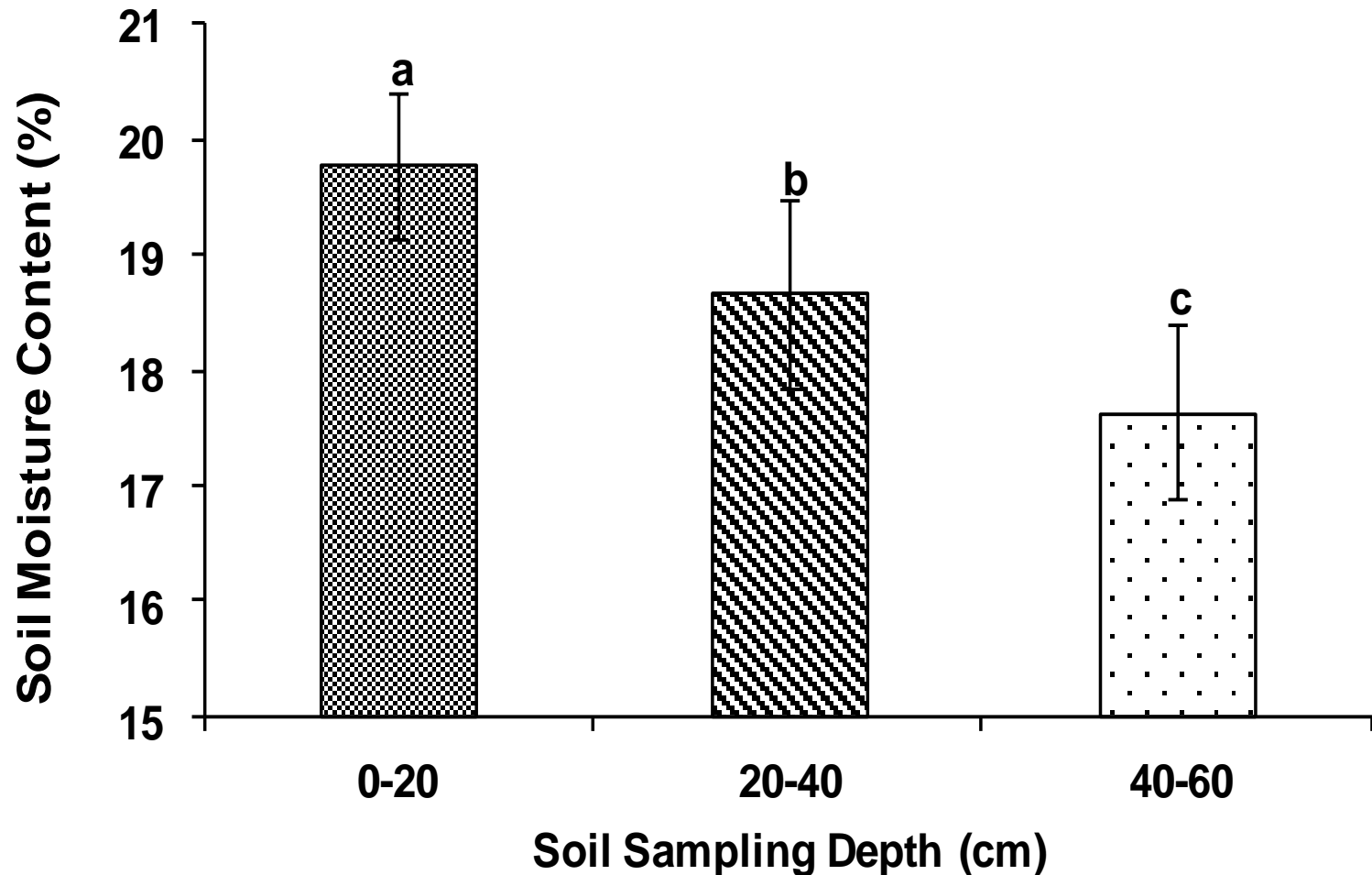
# Experiment Design and Treatments



- Factorial experiments laid in a RCBD with 4 replications
- Factors: Orientation, distance, and soil depth or time of the day

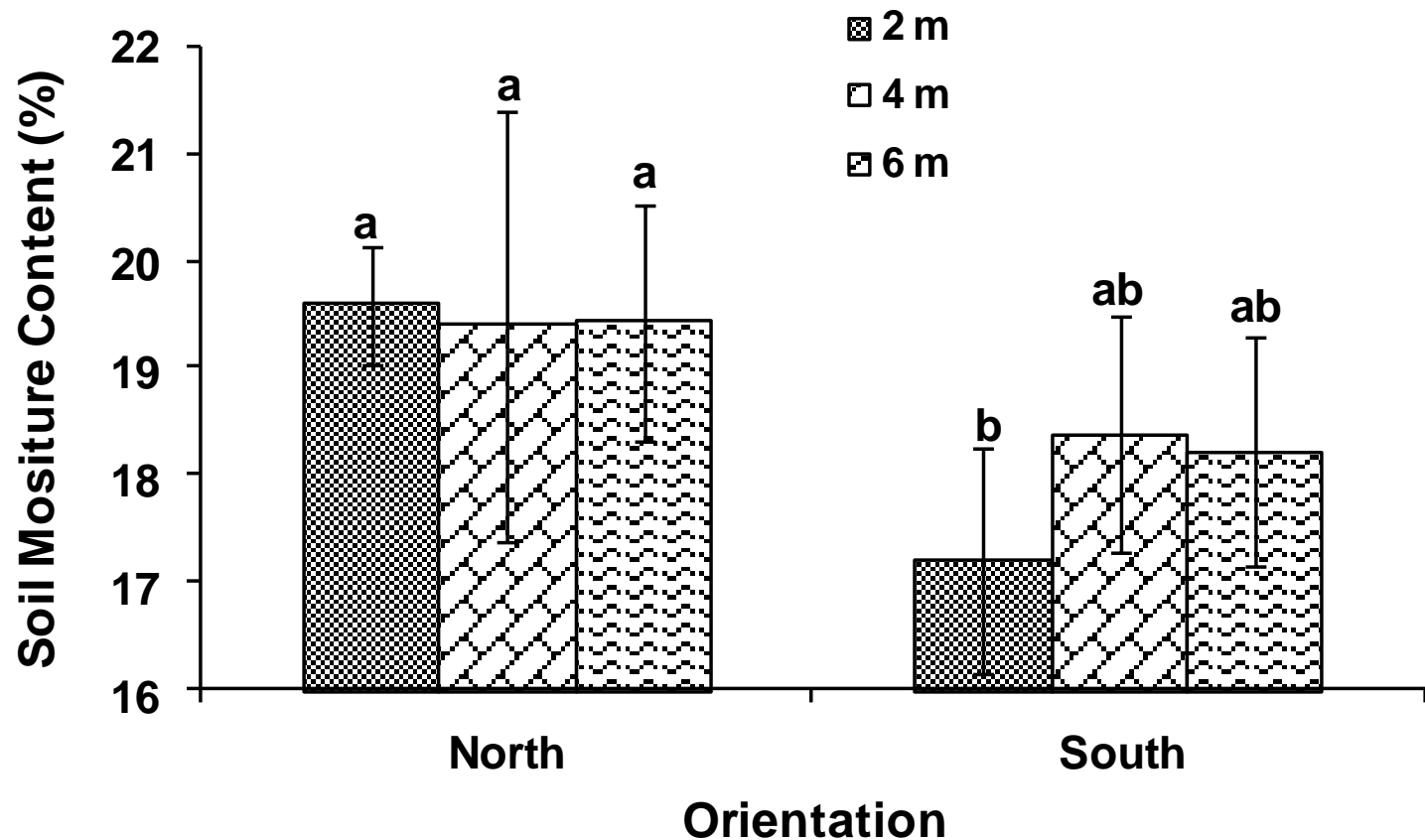
# Gravimetric Soil Moisture Content

- Decline of MC with sampling depth



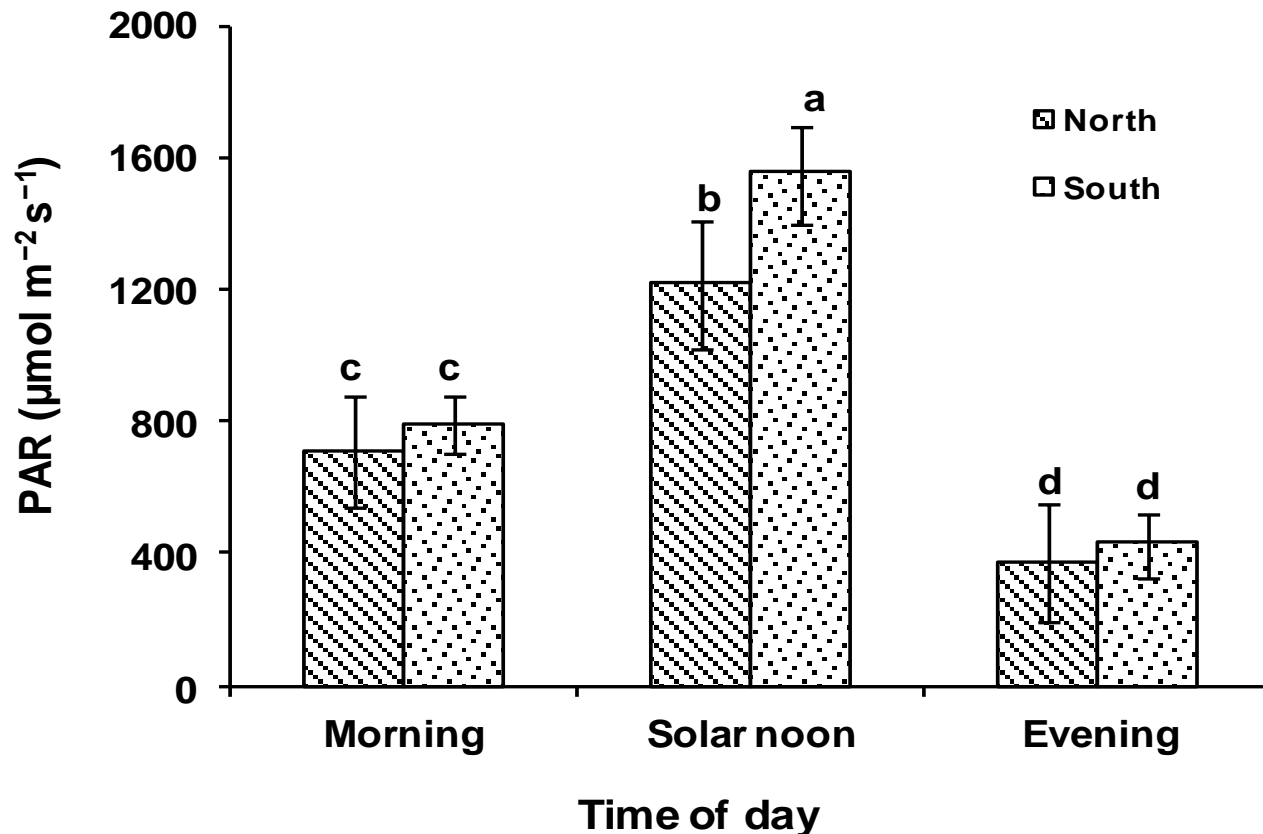
# Gravimetric Soil Moisture Content

- Lowest MC at 2-m in the south orientation



# Photosynthetically Active Radiation

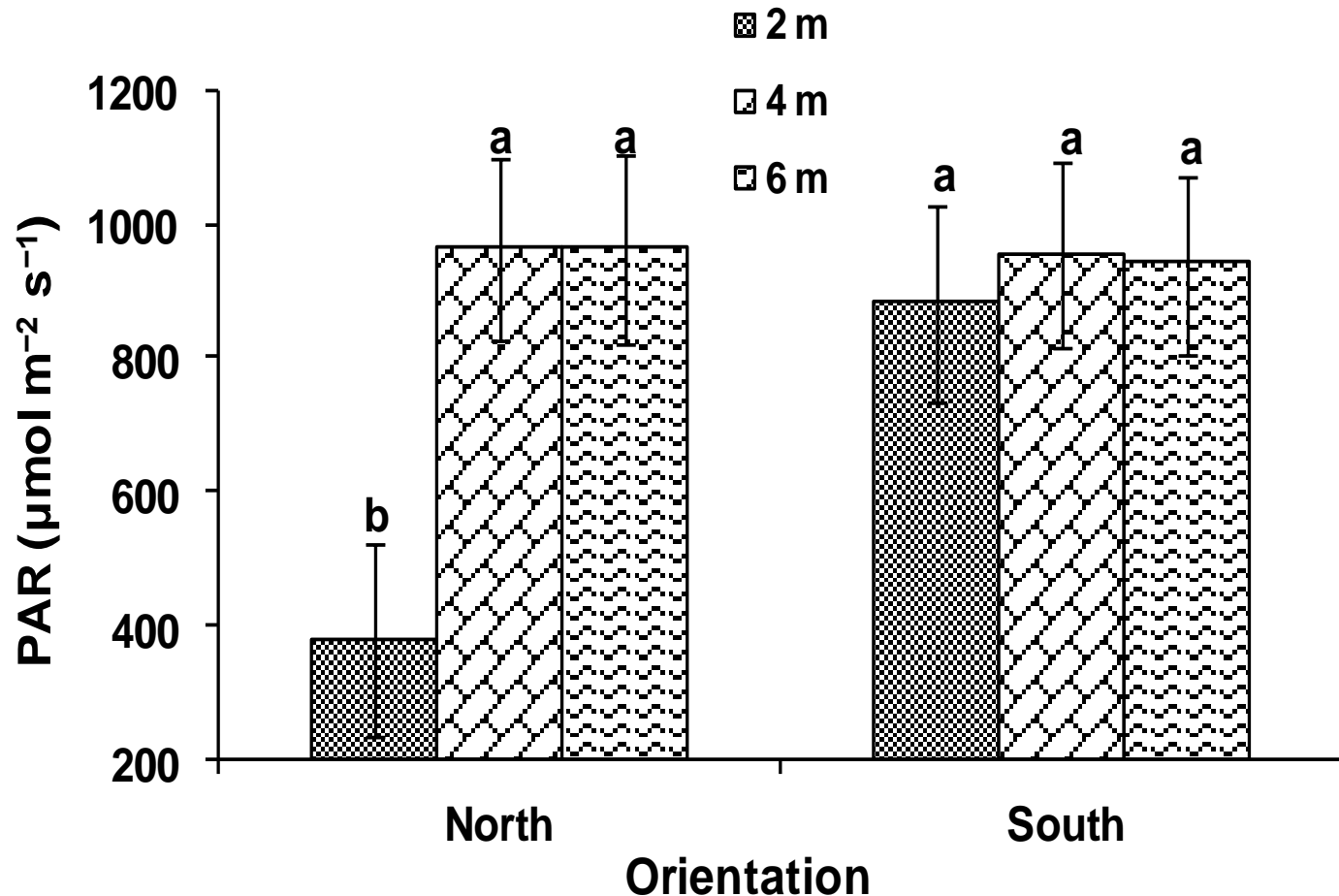
- Low PAR in the north orientation at noon





# Photosynthetically Active Radiation

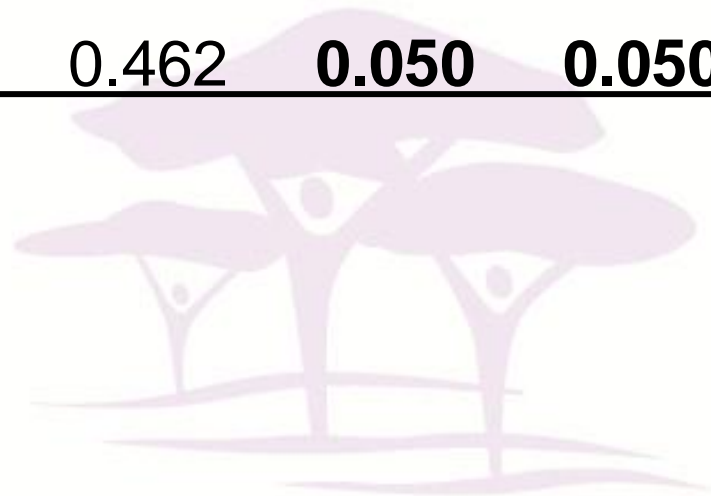
- Lowest PAR at 2-m in the north facing plots



# Yield and Nutrition of Oats

## ANOVA (P-values)

Distance	DM	ADF	NDF	TN	CP
Distance (D)	0.607	0.905	0.906	<b>0.050</b>	<b>0.050</b>
Orientation (O)	0.128	0.084	0.203	<b>0.022</b>	<b>0.024</b>
D x O	0.557	0.968	0.462	<b>0.050</b>	<b>0.050</b>



# Yield and Nutrition of Oats

Distance (m)	Orientation		
	DM (g/plot)	TN (%)	CP (%)
North			
2	94.70a	1.68a	10.48a
4	94.64a	1.34bc	8.38bc
6	94.91a	1.62a	10.09a
South			
2	94.60 a	1.23c	7.68c
4	94.55 a	1.33bc	8.31bc
6	94.55 a	1.53ab	9.54ab

# Conclusions

- More light in the south orientation possibly reduced SMC, leading to higher SMC in the north orientation
- Improved nutrition of Oats in north facing plots did not translate into biomass increase
  - Other factors like SMC were driving oats growth

# Conclusions

- Reduced SMC and PAR at the competition zone also did not adversely affect yield and nutrition of Oats.
- Manitoba maple trees can be integrated on-farm to diversify production cycles and improve soil conditions.



# Acknowledgements



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